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FEDERAL VALLEY

This investigation and report was made under authority of Section 202 of the Appalachian Regional Development Act of 1965. The work was a joint effort of the Economic Research Service, Forest Service, and Soil Conservation Service of the U. S. Department of Agriculture.

FEDERAL VALLEY WATERSHED INVESTIGATION REPORT

The Federal Valley watershed was selected because of known water and land resource problems existing in the area. The study investigated water rights, land use problems and needs for full potential development of water and land resources. The study was conducted as a part of the Appalachian Water Resource Survey and the Ohio Department of Natural Resources.

APPALACHIAN WATER RESOURCE SURVEY

In accordance with the plan of survey for the development of water resources in the Federal Valley watershed, the study was conducted by the U. S. Department of Agriculture, Economic Research Service, Forest Service, and Soil Conservation Service, and the Ohio Department of Natural Resources. This study was conducted to help in the development of water and land resources in the Federal Valley watershed.

**Athens, Morgan and Washington Counties
Ohio**

February 1967

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UNITED STATES DEPARTMENT OF AGRICULTURE

Economic Research Service Forest Service Soil Conservation Service

FOREWORD

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In accordance with the Plan of Survey for the Development of Water Resources in Appalachia, this report will be reviewed and commented on by agencies in the U. S. Department of Interior; Office of Appalachian Studies, U. S. Army Corps of Engineers; and the Ohio Department of Natural Resources. This review procedure will help insure the coordinated and orderly conservation, development, use, and management of water and land resources.

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THE WATERSHED IN BRIEF

Federal Creek originates in west central Morgan County and flows in a southeasterly direction into Athens County to its confluence with the Hocking River approximately twelve miles east of Athens, Ohio. The village of Amesville, with a population of about 275, is the largest in the watershed. Smaller villages include Sharpsburg, Joy, and Broadwell.

Federal Valley Watershed is approximately 18 miles long and 8 miles wide, with a total area of about 92,740 acres, or 145 square miles. It consists of about 54,810 acres in Athens County, 31,440 acres in Morgan County, and 6,490 acres in Washington County. The watershed is approximately 12 percent of the Hocking River sub-basin. Highway US-50A, an east-west alternate for US-50, bisects the watershed. This alternate route runs generally east from US Route 33 (north of Athens) to Marietta, Ohio.

The watershed lies in the East and Central General Farming and Forest Land Resource Region and the Central Allegheny Plateau Land Resource Area.

An estimated 85 to 95 percent of the soils in the watershed are upland soils developed on parent materials comprised of varying mixtures of acid and calcareous clay shales, limestones, sandstones, and siltstones. The majority of the upland soils are on benchy hill-sides with slopes ranging from 12 to over 40 percent. These soils are in the Ramsey, Gilpin, Weikert and Brooke series on steeper slopes and the Upshur, Summitville, Guernsey, Westmoreland, Vandalia and Woolper series on the more moderate slopes of the benches. They are well to moderately well drained, strongly acid to near neutral, range from shallow to deep, and most are very erosive if unprotected. Slips (mass movements of earth materials) are common, resulting in irregular topography in many places. Soils on the generally narrow ridgetops are in the Coolville, Woodsfield, Upshur, Tilsit, Guernsey, and Wellston series. Slopes range from 2 to 15 percent.

An estimated 3,000 acres of bottomland soils are mostly in the Senecaville, Moshannon, and Linside series. These soils are moderate to well drained, quite productive, but subject to flooding. Most of the flood plain is saucer-shaped, i.e., relatively flat with sharply rising sides.

Terrace soils are limited in extent and are mostly in the Markland and Vincent series.

Elevations range from 600 feet at the mouth of Federal Creek to 1,000 feet on the higher hills scattered over the watershed.

Present land use in the watershed is as follows: 28 percent cropland, 37 percent pasture, 32 percent woodland, and 3 percent in other uses. By 1980 land use is expected to be 29 percent cropland, 33 percent pasture, 34 percent woodland, and 4 percent in other uses.

Most of the forest land is privately owned. The State of Ohio owns 320 acres in Gifford State Forest and Wolf Creek Wildlife Area. The Federal Government owns 315 acres in Wayne National Forest. The forest land is predominantly hardwood. Most of the soils have a high potential for growing timber. Principal types are mixed hardwood and black ash-elm-red maple. Associated species are red oaks, sugar maple, yellow poplar, white oak, black locust, ash, elm, and red maple. The pines are Virginia, pitch, and short leaf. A market exists for fire wood, posts, pulp wood, and saw logs.

The principal agricultural economic activity in the watershed is small general farming. "Other-than-farm income" is 30 percent greater than sales of all farm products. Slightly over half of the farm operators work off-the-farm 100 days or more per year.

In 1964 the average size farm was 160 acres, an increase of 8 percent since 1959. Value of land and buildings for the average farm is about \$15,800, or \$98 per acre. This represents an increase since 1959 of 65 and 44 percent respectively. Value of all farm products sold averaged only \$2,600 per farm in 1964 but that still was an increase of 7 percent in five years. Livestock and livestock products make up 80 percent of the agricultural receipts.

Coal strip mining operations within the watershed yielded 30,000 tons during the 12-month period prior to October 1, 1966 according to the Ohio Division of Mines. There are numerous gas and oil wells many of which are in the flood plain.

WATERSHED PROBLEMS AND NEEDS

Floodwater Damages

Total annual floodwater damage to crops and pasture is estimated to be \$34,970. Other agriculture floodwater damage is estimated at \$4,280 annually. Approximately 2,820 acres of flood plain are subject to flooding by a 100-year frequency flood. Land use in the flood plain consists of: cropland, 73 percent; pasture, 20 percent; woodland, 5 percent; and other, 2 percent.

Estimated average annual urban damages amount to \$9,400 in Amesville, and \$270 in Sharpsburg. Part of Amesville floods frequently. A flood in 1963 resulted in extensive damages in Amesville and Sharpsburg. A study of the storm indicates a probability of recurrence to be once in 100 years. Protection against such a storm would be desirable.

Annual damage to roads and bridges in the watershed is about \$13,930. Total damages include indirect damages of 10 percent of agricultural damages and 15 percent of urban and transportation damages. See Table 1 for a listing of direct damages.

Erosion and Sediment

A very small part of the flood plain, adjacent to streams with steeper gradients, is subject to severe scouring.

There is moderate erosion of cropland and pastures taking place. Water-borne sediment contributes to damage in the flood plain areas.

Improper land use and abuse of forest land has left it in a generally poor hydrologic condition. This condition contributes to excessive runoff resulting in erosion, sediment production, and an increase in frequency of flooding. Since 32 percent of the watershed is forest land, improvement of the hydrologic condition is a major watershed need.

Agricultural Water Management

An estimated 25 percent of the flood plain consists of poorly and somewhat poorly drained soils which need tile and/or surface drainage for optimum crop and pasture production. Reduction of flooding and some channel improvement would make this drainage economically feasible. Generally, existing channels provide adequate clearance for tile outlets. There is no apparent need for irrigation water. Water for livestock and general farm use can be met through present programs.

Non-Agricultural Water Management

The village of Amesville has been seeking a solution to its municipal water supply problems since 1946. Village officials have been advised by the Ohio Division of Water that the answer is surface water storage. The present supply of well water is limited and additional wells are not practical because of highly mineralized ground water.

Water-related recreation facilities are extremely limited in this area of Ohio. Anticipated use of these facilities would provide economic enhancement within the watershed and to the adjacent towns and villages.

Public fishing within the watershed is limited to stream fishing. Most fishing is done below the junction of Sharp's Fork and Federal Creek. Early spring catches consist of smallmouth bass, channel catfish and shovel-head catfish. Summertime fishing is generally poor and is confined to pools on the main stem. Upstream and tributary fishing is limited by the intermittent nature of the streams with the resultant poor minnow production.

The USDI Federal Water Pollution Control Administration has reported the following: "The main stem of Federal Creek is periodically polluted by acid mine drainage, while its tributaries are affected to varying degrees. Also there is some indication of periodic high fractional concentrations. However, this is localized and can be corrected by proper sewage treatment practices".

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TABLE 1
ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE
 FEDERAL VALLEY WATERSHED, OHIO RIVER BASIN
 (Dollars) 1/

ITEM	DAMAGES
Crop and Pasture	31,790
Urban	8,410
Transportation	12,110
Other Agriculture	3,900
Subtotal	56,210
Indirect	6,650
Total Damage	62,860

1/ Price Base - Adjusted Normalized

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PHYSICAL POTENTIAL FOR MEETING NEEDS

The area has an average annual rainfall of 41 inches which yields 14 inches of annual runoff. This rainfall and runoff, if properly managed, is sufficient for all foreseeable future needs.

There are several potential reservoir sites within the watershed. Structures installed at the most economically feasible sites would do much toward eliminating the flooding problem. However, in order to provide protection for Amesville and Sharpsburg against a storm having a recurrence interval of 100 years, channel improvement is required. Due to small channel capacities in some of the agricultural reaches, channel work would be necessary to carry structure outflow and runoff from uncontrollable areas.

Potential reservoir sites would meet the storage requirements for municipal water and recreation. In addition, storage for low flow augmentation, quality control, and other beneficial uses, either in or outside the watershed would be available.

Erosion and sediment damage should be reduced. This can be done by improving and increasing soil cover on both open land and woodland. Mine spoil exists and should be revegetated. Most of the forest land has a medium to high potential to improve hydrologically. This potential can be realized with proper protection and management.

Contour strip cropping, supplemented by grassed waterways and diversions, could materially reduce runoff thereby minimizing erosion and sediment damage. Runoff from permanent pastures could be reduced by reseeding, liming and fertilizing and managed grazing programs.

LOCAL INTEREST IN PROJECT DEVELOPMENT

This watershed is in three soil and water conservation districts - 56 percent in the Athens District, 32 percent in the Morgan District, and 12 percent in the Washington District. The application for planning assistance under the Watershed Protection and Flood Prevention Act, Public Law 566, was signed by the supervisors of all three districts. The application was also signed by the Boards of County Commissioners of Athens, Morgan, and Washington Counties, the Hocking Conservancy District, and the Village Council of Amesville. The proposed project has the indorsement of local farm organizations, county agricultural extension agents, township trustees, civic clubs, county school superintendents, vocational agriculture teachers, sportsman organizations, and county and state highway departments.

The Hocking Conservancy District has legal authority to meet the needs for project action in the watershed.

The Ohio Department of Natural Resources, after a study of the watershed and review of the PL-566 Application, has recommended approval for further study through a preliminary investigation by the Soil Conservation Service.

There are 652 farms entirely or partially within the watershed. Total number of soil and water conservation districts cooperators is 182. This represents 28 percent participation.

WORKS OF IMPROVEMENT FOR POTENTIAL DEVELOPMENT

Land Treatment Measures

About 25 to 30 percent of the upland cropland needs contour strip cropping. Much of this land is now in the Conservation Reserve or the Feed-grain Program. Diversion channels are needed to protect bottom land from upland runoff. Grassed waterways are needed as protection for most of the upland cropland. About 75 percent of the permanent pastures need treatment with lime and fertilizer; 15 percent of this acreage needs reseeding.

Fire is not a serious problem in the forest land but continued protection is basic and essential to derive the maximum benefits from all watershed protective measures.

Tree planting is needed to establish an adequate protective cover on some abandoned agricultural lands and strip, clay, and gravel mine areas. Some of the poor oak sites need reinforcement planting to provide adequate stocking.

Logging roads, skid trails, and mine roads should be properly located and maintained for erosion control. Protection of forest land from domestic livestock grazing is needed on parts of the watershed; wildlife would also benefit from such protection.

Stand improvement practices which would improve hydrologic conditions are needed on a large part of the forest land to establish and develop desirable species and to maintain favorable stocking and stand conditions. Wildlife habitat preservation and development would also improve the hydrologic aspects of the watershed.

Structural Measures

A total of 12 potential floodwater retarding structure sites were examined during this investigation. One site was discarded due to its location in the lower end of the watershed and its high construction costs. The remaining potential structures could provide the desired flood protection for the most of the watershed. However, channel improvement is needed to provide 100-year flood protection for the villages of Amesville and Sharpsburg in addition to three-year protection for three of the agricultural reaches. The structures could control about 33,700 acres or 36 percent of the watershed. All sites have potential multiple purpose use.

The 100-year flood prevention channel obtained through channel improvement could include 3,000 feet at the lower end of reach #5 and would extend into reach #4 to the point at which backwater would no longer flood Amesville. The lower 1,500 feet of both reaches #1 and #2 would likewise require a 100 year channel for protection at Sharpsburg. The upper end of reach #3 must also be enlarged to prevent backwater from flooding Sharpsburg. Reach #7 and the lower end of reaches #3 and #4 need improving to provide three-year agricultural protection.

In addition to floodwater retarding storage, Structure Site Nos. 3 and 4 could provide additional storage for recreational purposes. These structure sites would have a recreational surface area of 100 acres and 300 acres, respectively. Basic facilities would provide for power boating, picnicking, fishing, swimming, sightseeing and camping. Included in these facilities are roads, trails, and sanitary provisions.

The recreational pool at Structure Site No. 3 could provide Amesville with the desired surface storage for water supply. An amount of 200 acre feet was used in the cost allocation.

The population projection for Appalachian Economic Sub-Region 8 shows increases as follows: 1980 - 35.5%, 2000 - 83.4%, and 2020 - 137.6%. The projections used for Amesville were estimated to be increases of 27, 63, and 100% respectively. The projected population for Amesville would be estimated as follows: from 1960 - 275, 1980 - 350, 2000 - 450, and 2020 - 550.

The other nine sites have the potential of providing 14,500 acre feet of beneficial storage for stream flow augmentation, pollution control, or other future water resource needs in addition to the flood prevention storage. The amount of beneficial storage for each site was limited by the estimated average annual net water yield of the controlled area. Beneficial storage amounted to approximately seven inches. For more specific information on the above-mentioned potential sites, see Tables II and III and the watershed map.

TABLE II

STRUCTURE DATA
FEDERAL VALLEY WATERSHED, OHIO RIVER BASIN

Site Number	Drainage Area (Sq.Mi.)	Est. Height of Dam (Feet)	Est. Vol. of Fill (Cu.Yd.)	PRINCIPAL SPILLWAY		EMERGENCY SPILLWAY		Max. Sur. Area Em. Spill. Level (Acres)
				Type	Release Rate (CSM)	Type	% Chance of Use	
1	4.6	42 (67)	74,000 (210,000)	Reinforced Concrete Conduit	12	Veg.	1	55 (100)
2	8.8	44 (64)	85,000 (210,000)	"	12	Veg.	1	175 (275)
3	4.0	58 (58)	160,000 (160,000)	"	13	Veg.	1	115 (115)
4	9.8	54 (54)	150,000 (150,000)	"	12	Veg.	1	375 (375)
5	2.2	42 (65)	48,000 (140,000)	"	23	Veg.	1	30 (50)
6	3.4	33 (49)	33,000 (94,000)	"	14	Veg.	1	65 (110)
7	5.5	43 (59)	40,000 (107,000)	"	12	Veg.	1	100 (190)
8	4.9	46 (68)	87,000 (220,000)	"	12	Veg.	1	80 (165)
9	2.8	37 (55)	37,000 (97,000)	"	19	Veg.	1	45 (85)
10	3.2	35 (53)	39,000 (105,000)	"	16	Veg.	1	60 (115)
11	3.4	40 (58)	92,000 (210,000)	"	16	Veg.	1	60 (100)
TOTAL	52.6		845,000 (1,703,000)					1,160 (1,680)

NOTE: Figures not in parentheses indicate the development of the site for identified needs.

Figures in parentheses reflect the development of the site to its full potential.

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TABLE II-A

CHANNEL IMPROVEMENT
FEDERAL VALLEY WATERSHED, OHIO RIVER BASIN

Channel Designation	Length of Reach (100 Ft.)	Watershed Area <u>1</u> / (Sq. Mi.)	Needed Channel Capacity (cfs)	Bottom Width (Ft.)	Depth (Ft.)	Velocity in Chan. (F/sec.)	Estimated Volume of Excavation (Cu. Yds.)
Reach #1-B <u>1</u> / ₁	15	5	1,650	45	6	4.4	11,000
Reach #2-B <u>1</u> / ₁	15	14	2,580	60	8	3.8	20,000
Reach #3-A <u>2</u> / ₁	25	19	4,000	80	8	4.4	47,000
Reach #3-B <u>1</u> / ₁	110	23	1,100	40	6	3.5	90,000
Reach #4	100	34	7,730	90	10	5.1	178,000
Reach #5-B <u>1</u> / ₁	30	14	2,700	55	8	4.3	32,000
Reach #7	150	14	1,200	40	6	3.8	89,000
TOTAL	445						<u>467,000</u>

1/₁ Referred to in the write up as lower end of reach.

2/₁ Referred to in the write up as upper end of reach.

TABLE III

RESERVOIR STORAGE CAPACITY
FEDERAL VALLEY WATERSHED, OHIO RIVER BASIN

Site No.	Drainage Area	STORAGE CAPACITY EVALUATED							Additional Storage Capacity Available					
		FLOOD PREVENTION			Recreation	Water Supply	Total							
		Sediment	Detention	Subtotal										
	(Sq.Mi.)	(Ac.Ft.) (In.)	(Ac.Ft.) (In.)	(Ac.Ft.) (In.)	(Ac.Ft.) (In.)	(Ac.Ft.) (In.)	(Ac.Ft.) (In.)	(Acre Feet)						
1	4.6	310	1.2	640	2.6	950	3.8	-	950	3.8	1,720			
2	8.8	590	1.2	1,220	2.6	1,810	3.8	-	-	1,810	3,300			
3	4.0	320	1.5	550	2.6	870	4.1	1,280	6.0	200	1.0	2,350	11.1	-
4.	9.8	780	1.5	1,360	2.6	2,140	4.1	3,660	7.0	-	-	5,800	11.1	-
5	2.2	150	1.2	310	2.6	460	3.8	-	-	-	-	460	3.8	820
6	3.4	230	1.2	480	2.6	710	3.8	-	-	-	-	710	3.8	1,290
7	5.5	370	1.2	760	2.6	1,130	3.8	-	-	-	-	1,130	3.8	2,050
8	4.9	320	1.2	670	2.6	990	3.8	-	-	-	-	990	3.8	1,810
9	2.8	190	1.2	390	2.6	580	3.8	-	-	-	-	580	3.8	1,060
10	3.2	210	1.2	440	2.6	650	3.8	-	-	-	-	650	3.8	1,180
11	3.4	230	1.2	470	2.6	700	3.8	-	-	-	-	700	3.8	1,270
TOTAL	52.6	3,700		7,290		10,990		4,940		200		16,130		14,500

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NATURE AND ESTIMATE OF COSTS OF IMPROVEMENTS

The basis for estimating the costs of potential structural improvements was obtained from a stage storage curve developed from a 7½ minute USGS Quadrangle sheet. Crest of the emergency spillway was set to provide flood storage for 2.6 inches of runoff. Design and freeboard elevations were determined by a modification of the rapid routing procedure developed by the S.C.S. Regional Technical Service Center at Upper Darby Pennsylvania. Estimated cost of each potential structure was based on a unit cost per cubic yard of earthfill taken from the 1965 unit cost curve. The curve was plotted from the total bids of actual contracts awarded for watershed structures in similar land resource areas. A 20 percent contingency was added to the estimated cost to obtain construction cost of each structure. Channel improvement costs were based on the difference in channel sizes of the existing surveyed cross sections and the size required for the desired protection.

Installation service cost was in accordance with cost records from the Soil Conservation Service files for similar structures built in the last five years.

Easement costs were based on local property values and from observations in the field and from elevations based on the USGS Quadrangle sheets. For the level of development to meet identified needs, \$126,000 was included for relocating and raising public roads, \$139,000 for relocating or weighting pipelines, \$238,000 for buildings, and \$379,800 for land easements.

Operation and maintenance costs for the 11 structures and channel improvement were estimated to be \$30,000 annually.

For the multipurpose structures, the Use of Facilities Method was used to determine allocated joint costs between purposes. Cost of administering the contract was estimated to be three per cent of construction costs. See Tables IV, V, and VI for details.

TABLE IV

ESTIMATED STRUCTURAL COST
FEDERAL VALLEY WATERSHED, OHIO RIVER BASIN

(Level of Development to Meet Identified Needs)

Item	Unit	Amount Planned	Estimated Total Cost (Dollars) <u>1/</u>
STRUCTURAL MEASURES:			
Construction			
Floodwater Retarding Str.	No.	9	882,500
Multiple Purpose Structures			
FP & Water Supply & Rec.	No.	1	270,400
FP & Recreation	No.	1	314,200
Channel Improvement	Mile	14	245,800
Subtotal			1,712,900
Installation Service			548,500
Land Easements & R. W.			880,900
Administration of Contracts			50,600
TOTAL STRUCTURAL MEASURES			3,192,900

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1/ Price Base 1965

TABLE V

DISTRIBUTION OF STRUCTURAL COST
FEDERAL VALLEY WATERSHED, OHIO RIVER BASIN

(Level of Development to Meet Identified Needs)

Structural Measures	Str. No.	Installation Cost (Dollars) 1/				Installation Cost
		Construction	Installation Services	Land Easements and R. W.	Admin. of Contracts	
Single Purpose Structures:						
Flood Prevention	1	124,400	41,100	12,100	3,700	181,300
Flood Prevention	2	117,400	38,800	115,600	3,500	275,300
Flood Prevention	5	92,200	30,400	16,500	2,800	141,900
Flood Prevention	6	71,300	23,500	64,800	2,100	161,700
Flood Prevention	7	72,000	23,800	33,500	2,200	131,500
Flood Prevention	8	125,200	41,300	16,000	3,800	186,300
Flood Prevention	9	77,800	25,600	65,600	2,300	171,300
Flood Prevention	10	70,200	23,100	22,300	2,100	117,700
Flood Prevention	11	132,200	43,600	27,700	4,000	207,300
Multiple Purpose Structures:						
F.P., W.S. & Rec.	3	170,400	56,200	75,600	5,100	307,300
Basic Facilities		100,000	33,000	25,000	3,000	161,000
F.P., & Rec.	4	189,200	62,400	240,400	5,700	497,700
Basic Facilities		125,000	41,300	50,000	3,800	220,100
Channel Improvement		245,800	64,400	115,800	6,500	432,500
TOTAL		1,712,900	548,500	880,900	50,600	3,192,900

TABLE V-A

DISTRIBUTION OF STRUCTURAL COST
FEDERAL VALLEY WATERSHED, OHIO RIVER BASIN

(Full Development Potential)

Structural Measures	Str. No.	Installation Cost (Dollars) 1/				
		Construction	Installation Services	Land Easements and R. R.	Admin. of Contracts	Installation Cost
Multiple Purpose Structures:						
FP, WS, & Rec. Storage	3	170,400	56,200	75,600	5,100	307,300
Basic Facilities		100,000	33,000	25,000	3,000	161,000
FP, & Rec. Storage	4	189,200	62,400	240,400	5,700	497,700
Basic Facilities		125,000	41,300	50,000	3,800	220,100
FP, & Beneficial Storage	1	290,400	95,700	46,300	8,700	441,100
" "	2	252,000	83,200	210,800	7,500	553,500
" "	5	201,600	66,500	55,600	6,000	329,700
" "	6	146,400	48,300	78,400	4,400	277,500
" "	7	147,600	48,700	92,700	4,400	293,400
" "	8	277,200	91,400	43,500	8,300	420,400
" "	9	151,200	49,900	77,500	4,500	283,100
" "	10	145,200	47,900	71,100	4,400	268,600
" "	11	252,000	83,200	44,600	7,500	387,300
Structure Subtotal		2,448,200	807,700	1,111,500	73,300	4,440,700
Channel Improvement		245,800	64,400	115,800	6,500	432,500
TOTAL		2,694,000	872,100	1,227,300	79,800	4,873,200

1/ Price Base 1965

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TABLE VI

COST ALLOCATION
 FEDERAL VALLEY WATERSHED, OHIO RIVER BASIN
 (Level of Development to Meet Identified Needs)

(Dollars) 1/

Item		Flood Prevention	Recreation	Water Supply	Total
Single Purpose:					
Structure No.	1	181,300	-	-	181,300
" "	2	275,300	-	-	275,300
" "	5	141,900	-	-	141,900
" "	6	151,700	-	-	151,700
" "	7	131,500	-	-	131,500
" "	8	185,300	-	-	185,300
" "	9	171,300	-	-	171,300
" "	10	117,700	-	-	117,700
" "	11	207,300	-	-	207,300
Multiple Purpose					
Structure No.	3	83,400	193,200	30,700	307,300
Basic Facilities			161,000		161,000
Structure No.	4	184,000	313,700	-	497,700
Basic Facilities			220,100		220,100
Channel Improvement		432,500			432,500
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TOTAL		2,274,200	888,000	30,700	3,192,900
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1/ Price Base 1965

TABLE VI-A

COST ALLOCATION

FEDERAL VALLEY WATERSHED, OHIO RIVER BASIN

(Full Development Potential)

(Dollars) 1/

Item		Flood Prevention	Recreation	Water Supply	Additional Beneficial Storage Available	Total
Multiple Purpose:						
Structure No.	1	132,100	-	--	309,000	441,100
" "	2	165,900	-	-	387,500	553,500
" "	3	83,400	193,200	30,700	-	307,300
Basic Facilities			161,000			161,000
Structure No.	4	184,000	313,700	-	-	497,700
Basic Facilities			220,100			220,100
Structure No.	5	98,900	-	-	230,800	329,700
" "	6	83,300	-	-	194,200	277,500
" "	7	83,000	-	-	205,400	293,400
" "	8	126,000	-	-	294,400	420,400
" "	9	84,900	-	-	198,200	283,100
" "	10	80,500	-	-	188,000	268,500
" "	11	115,000	-	-	271,300	387,300
Channel Improvement		432,500	-	-	-	432,500
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TOTAL		1,575,600	888,000	30,700	2,278,900	4,873,200
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1/ Price Base 1965

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EFFECTS AND ECONOMIC FEASIBILITY OF POTENTIAL DEVELOPMENT

Average annual flood damage reduction benefits were estimated to be \$51,180 from structural measures and \$1,883 from land treatment. Land enhancement to agriculture, including more intensive use and some changed land use, was estimated to provide benefits of \$12,500.

Minimum basic facilities for recreation were figured for structure Site Nos. 3 and 4. Average annual use was estimated at 110,000 visitor-days. A benefit rate of \$1.50 per visitor-day was assigned. After discounting, the average annual benefit would be \$154,770. The development of additional water storage facilities will increase recreational use of the surrounding land. This will have an impact on the management and protection of the area.

Water supply benefits from Structure Site No. 3 were estimated to be \$1,960 annually. This is based on the assumption that a 1:1 basis would be used between annual costs and annual benefits.

Direct redevelopment benefits were used in the evaluation and were estimated at \$46,380. This includes 30 percent of the construction costs and 50 percent of operation and maintenance cost (both are on an annual equivalent basis). Other national secondary benefits were not evaluated. Criteria for estimating these benefits were not available. They will be provided later by the Corps of Engineers.

Local secondary benefits would be \$26,130 annually.

The ratio of average annual benefits to average annual cost for all works of improvement, including primary and secondary benefits, would be 2.4:1. The benefit cost ratio excluding local secondary benefits, would be 2.2:1.

Summary of benefits, costs and comparisons are listed in the attached TABLES VII AND VIII.

With the level of improvement described, the villages of Amesville and Sharpsburg would have 100-year flood protection in the developed areas. A three year level of protection would be provided for agricultural reaches.

For present conditions, the three-year flood would inundate 1,050 acres and the 100-year flood would cover 2,820 acres. With the level of development described in this report the amount flooded would be 60 and 2,380 acres, respectively, for a three-year and a 100-year flood.

TABLE VII

ANNUAL COST
FEDERAL VALLEY WATERSHED, OHIO RIVER BASIN

(Dollars) 1/

Evaluation Unit	Amortization of Installation Cost <u>2/</u>	Operation and Maintenance Cost	Other Economic Cost	Total
1	104,600	30,000 <u>3/</u>	-	134,600

1/ Price Base 1965 for installation costs and adjusted normalized for operations and maintenance and other economic costs.

2/ 3-1/8% - 100 year amortization period.

3/ Includes \$20,000 for annual operation and maintenance of the recreation facilities.

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TABLE VIII

COMPARISON OF BENEFIT AND COST FOR STRUCTURAL MEASURES
FEDERAL VALLEY WATERSHED, OHIO RIVER BASIN

(Dollars) 1/

Evaluation Unit	AVERAGE ANNUAL BENEFITS					Local Secondary	Total	Average Annual Costs	Benefit Cost Ratio
	Flood Prevention	Damage Reduction	More Intensive Use (Agr.Lands)	Recreation	Water Supply	Redevelopment			
1	51,180	12,500	154,770	1,960	46,380	26,130	319,050	134,600	2.4:1
TOTAL	51,180 <u>2/</u>	12,500	154,770	1,960	46,380	26,130	319,050	134,600	2.4:1

1/ Price Base - Adjusted Normalized for benefits, operation and maintenance and other economic costs; 1965 for installation cost.

2/ In addition it is estimated that land treatment measures will provide flood damage reduction benefits of \$1,883 annually.

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ALTERNATE OR ADDITIONAL POSSIBILITIES

1. Three large structure sites in the lower end of the watershed were not included in this report due to small amount of flood-water damage below them. These sites, however, could be developed for recreation, fish and wildlife, or other beneficial purposes.
2. The cost of multiple purpose Structure Site No. 4 was greatly affected by a pipe line in the upper end of the pool. Further study might indicate a smaller pool to be more economical. The site may be more favorable as a fish and wildlife reservoir.

